

1.11   มาตรฐานและคุณสมบัติทางเทคนิค (Standard and Specification)

(Specification No. RMIS-072/2562)

(สำหรับรายการที่ 1 และ รายการที่ 2)

### STATIONARY BATTERIES, BATTERY CHARGERS, AND ACCESSORIES

Specification No.: RMIS-072/2562

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#### Invitation to Bid No.:

#### **C Material, equipment, and specifications for STATIONARY BATTERIES, BATTERY CHARGERS, AND ACCESSORIES**

#### **C1 General material and packing instructions**

Additional to the general instructions, the following shall be observed:

#### **1a Scope**

These specifications cover stationary batteries, battery chargers, and accessories to be used for supplying direct current energy to substation equipment.

#### **1b Standards**

The batteries shall be manufactured and tested in accordance with the following standards:

Thai Industrial Standards (TIS)

TIS 718-2530 Stationary lead acid storage batteries

Or International Electrotechnical Commission (IEC)

IEC 60896-11: 2002 Stationary lead-acid batteries – Part 11: Vented types – General requirement and methods of tests

Or Deutsches Institut für Normung (DIN)

DIN 40736-1: 1992 Lead acid batteries – Part 1: Stationary vented cells with positive tubular plates in plastic-containers

And all other relevant standards, unless otherwise specified in these specification.

PEA will also accept the batteries manufactured and tested in accordance with the later edition of the above standards.

PEA will also accept the type test report in accordance with the previous edition of the above standards, if there is no significant change in any test items or no additional test item(s) compared with the above standards. On the other hand, if there is significant change in any test items or there are any additional test items, the previous edition type test report with the additional test report(s) of the significant change test item(s) and/or additional test item(s) will be also accepted.

The battery chargers shall be manufactured and tested in accordance with the IEC, NEMA, ANSI, or equivalent; unless otherwise specified in these specifications.

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#### 1c Principal requirement

##### 1c.1 Service conditions and installation

The batteries, battery chargers, and accessories shall be designed and constructed for indoor installation and operation in the Kingdom of Thailand and under the following conditions:

- Altitude : up to 1,000 m above sea level
- Ambient air temperature : 40°C, maximum  
: 35°C, average on one (1) day
- Relative humidity : up to 94%
- Climate condition : tropical climate

And additional conditions for the batteries:

- Operating temperature range : -10°C to 40°C

##### 1c.2 Batteries and accessories

The batteries shall be vented lead-acid type, delivered dry charged or moist charged.

For each set of battery stated in “C3 Schedule of detailed requirement”, 110% of required electrolyte shall be contained in a separate container. The electrolyte-containers shall have label showing manufacturer’s name, country of origin, quantity, specific gravity, and mark “DANGER”.

##### 1c.2.1 Batteries requirement

###### - Nominal voltage

The nominal voltage of the battery shall be 2 V.

###### - Floating voltage

The floating voltage, required to keep the batteries in full charged, shall be between 2.15 to 2.23 volts per cell (VPC).

###### - Equalizing/Boost voltage

The equalizing/boost voltage, for charging time, not more than 72 hours, shall be between 2.30 to 2.40 volts per cell (VPC).

###### - Plates

The positive plates shall be clad-form plate (tubular type). The negative plates shall be pasted-form plate.

###### - Battery containers and covers

The battery containers shall be made of transparent styrene acryl nitrile (SAN) and shall be leakproof type. The maximum and minimum electrolyte level lines shall be provided for each cell. The clearance between the cover and container shall be sealed with a sealing compound so that the gas generated in the battery shall not come out from other parts, except the vent plug. The cover shall be provided with ceramic, explosive retarding and spray proved vent plug.

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#### - Terminal posts and connectors

The cell terminal posts, intercell connectors, and end-cell connectors shall have adequate current carrying capacity at all ratings. The intercell connectors shall be supplied to provide a distance of 8 – 13 mm between adjacent cells. The terminals, such that the connection, shall be made by means of bolts and nuts or threaded insert type.

#### - Electrolyte

The electrolyte for the batteries shall be sulphuric acid ( $H_2SO_4$ ) diluted with distilled water with fully charged specific gravity of  $1.24 \pm 0.010$  kg/l at  $20^\circ C$  (for DIN or IEC standard) or  $1.21 \pm 0.010$  kg/l at  $27^\circ C$  (for TIS standard)

#### - Marking

Each cell of the batteries shall be clearly marked, as follows:

- (1) The mark “+” and “-”, marking on the positive and negative terminal posts and on the cover
- (2) Type
- (3) Nominal capacity, at 10 h rate, in Ah
- (4) Nominal voltage in V
- (5) Date, month, and year of manufacture
- (6) Manufacturer’s name or trade-mark
- (7) Country of origin
- (8) Others according to manufacturer’s design

#### - Operating life expectancy

The operating life expectancy of the batteries shall be of at least twenty (20) years at  $20^\circ C$  when maintained and charged in accordance with the manufacturer’s recommendations.

#### 1c.2.2 Battery accessories

Each set of the batteries stated in “C3 Schedule of detailed requirement” shall be supplied with the following accessories:

- (1) All necessary connectors with bolts and nuts or threaded inserts
- (2) Two (2) sets of filler funnel, syringe, acid jug, portable thermometer, portable hydrometer, with carrying case(s)
- (3) Two (2) sets of cell testing voltage meter, digital type, with carrying case(s)
- (4) One (1) set of insulated wrenches to fit bolts/nuts
- (5) One (1) set of maintenance tools box
- (6) Power cord with at least 30 m in length
- (7) All necessary accessories according to manufacturer’s design

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#### 1c.2.3 Battery racks

The battery cells shall be mounted on step like battery racks of structural steel with plastic or hard rubber covered on rails. The racks shall be treated with primer coat and painted with two (2) coats of acid resistant paint of grey colour or hot-dip galvanized and arranged so that the bottom of the batteries shall not be less than 300 mm above the floor.

#### 1c.2.4 Battery manufacturer's experience

The bidders shall give evidence about long term manufacturing and sale experience of the batteries' manufacturer. The manufacturer shall have experience in providing the same type/model of the proposed batteries to electrical utilities in Thailand at least five (5) years.

The bidder shall submit manufacturer's batteries supplying list indicating name and country of customers, model of the batteries and year of delivery.

#### 1c.3 Battery chargers and accessories

##### 1c.3.1 Battery chargers requirement

The battery chargers, with an automatic voltage regulator, shall be solid-state and floor mounting type.

The battery chargers shall meet the following requirements:

##### - Operating condition

The battery chargers shall be suitable for independent operation and parallel with the specified batteries.

##### - Voltage regulation

The output voltage shall be maintained within  $\pm 2\%$  of the preset charger voltage, for load variations of 0 to 100%, AC input voltage variations of  $\pm 10\%$ , and frequency variations up to  $\pm 2\%$  ( $\pm 1$  Hz).

##### - Charging rates

The float and equalizing charging rates shall be selectable and adjustable on the charger control panel.

##### - Stability

For any sudden changes of charging rate or for any surges in the input AC voltage, the charger output voltage shall not oscillate for more than ten (10) seconds.

##### - Current limiting circuit

The battery chargers shall be equipped with current limiting circuit to prevent any serious overloads during surges and with fully discharged battery. The current limit point shall be set at about 115% of full load rating.

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#### - Protection

The battery chargers shall prevent the battery from discharge back through the chargers in the case of an AC power failure, and shall have circuit-breakers to protect input and output.

#### - Control cubicle

Interior and exterior surfaces shall be painted with a primer coat and finish with one (1) weather-resistance coat of grey. Meters, voltage adjusting equipment and other necessary controls shall be mounted on the front panel of the cubicle.

#### - Equalizing charging timer

The equalizing charging timer shall be equipped with an automatic change-over switch which shall change the charging stages from equalizing charge to float charge at the pre-set time during 0 to 72 hours.

#### 1c.3.2 Accessories

Each set of battery charger stated in “C3 Schedule of detailed requirement” shall be equipped with the following accessories:

- (1) DC voltmeter
- (2) DC ammeter(s).
- (3) Ground detection device(s)
- (4) AC power failure alarm
- (5) Power on indication lamp
- (6) Power supply terminal blocks
- (7) Grounding terminal
- (8) Other necessary accessories according to manufacturer’s design

#### 1d Test and test reports

##### 1d.1 Type tests

The batteries and battery chargers shall be passed type tests in accordance with standards as specified in clause 1b.

PEA will also accept the batteries and battery chargers passed the type tests in accordance with the later edition of the above standard which may have a different test items or test procedure comparing with standards as specified in clause 1b.

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All items of the type tests shall be conducted or inspected by the acknowledged testing laboratories/institutes as following:

- (1) Laboratories/institutes which are members of the Short-circuit Testing Liaison (STL) or independent laboratories/institutes which are accredited according to TIS 17025 or ISO/IEC 17025 with the scope of accreditation covered the relevant test items, standards and equipment. The certification and scope of accreditation of the independent laboratories/institutes shall be submitted with the bid for consideration.
- (2) Thailand's national laboratories, institutes, universities and electric utilities, as follows:
  - National Metal and Materials Technology Center (MTEC)
  - Electrical and Electronic Products Testing Center (PTEC)
  - Thai Industrial Standards Institute (TISI)
  - Electrical and Electronics Institute (EEI)
  - Department of Science Service (DSS)
  - Testing Laboratory, Electrical Engineering Department, Faculty of Engineering, Chulalongkorn University
  - Electricity Generating Authority of Thailand (EGAT)
  - Metropolitan Electricity Authority (MEA)
  - Provincial Electricity Authority (PEA)
  - Other laboratories, institutes, universities or electric utilities approved by PEA.

In case of the foreign manufacturers have experience of more than twenty (20) years in design, manufacture and sell the batteries/battery chargers, PEA will accept type test report(s) conducted by the manufacturer's laboratory or other independent laboratories without qualification mentioned in (1) or (2). Documents showing the manufacturer's experience such as reference list shall be submitted with the bid for consideration.

The bidders or manufacturers who prefer to carry out the type tests of the batteries/battery chargers by the laboratories or by the manufacturer himself without the qualification mentioned above, the detail of the test facilities of the laboratories or the manufacturer shall be submitted to PEA for approval before proceeding the tests and before the bid closing date. PEA reserves the right to send representatives to inspect and witness the tests with the cost of the bidders or manufacturers.

The type test report done by the laboratories in Thailand or local manufacturers shall be valid within five (5) years counted from the issued date in the test report to the bid closing date.

**The type test report of batteries and battery chargers shall be submitted with the bid.**

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PEA will also accept other documents instead of the type test reports and type test certificates in the following conditions:

- (1) In case the proposed batteries or battery chargers have been supplied to PEA and get the order from PEA's Procurement Department or Substation Work Department (from PEA's head office), the Purchase Order (PO) or Contact with List of supplier or Proposal form can be submitted, or
- (2) In case the proposed batteries or battery chargers have been registered for PEA Product Acceptance, the not-expired registration certificate counted to the bid closing date can be submitted, or
- (3) In case the proposed batteries or battery chargers have been registered for Product lists for substation turnkey project, the not-expired registration certificate counted to the bid closing date can be submitted instead

However, the document in case (1), (2) and (3) shall be proved that the batteries or battery chargers specified in the PO or List of supplier or Proposal form or registration certificate shall be the same product, type/model and all ratings as the proposed batteries or proposed battery chargers for this bid.

**The cost of all tests and reports shall be borne by the bidders or manufacturers.**

#### 1d.2 Routine tests

The batteries and battery chargers shall be passed the routine tests in accordance with standards as specified in clause 1b and also passed the routine tests in accordance with a manufacturer's standard.

**The list of the routine tests shall be submitted with the bid.**

**The cost of all tests and reports shall be borne by the contractor or manufacturers.**

#### 1d.3 Commissioning tests

In case of PEA purchasing batteries or battery chargers completed with installation, the batteries or battery chargers will be tested after installation, according to PEA's standard at least the following commissioning tests items describe below:

- Battery commissioning test items

- (1) Polarity check of each cell
- (2) Extra charging, 0.1 C according to charge characteristic from manufacturer
- (3) Voltage, specific gravity and temperature test of each cell every one hour of charging process
- (4) Discharge characteristic test
- (5) Fastening of battery connection check by torque wrench
- (6) Dropping voltage between battery's pole and adjacent battery's pole



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- Battery Charger commissioning tests items:

- (1) General construction
- (2) Polarity check
- (3) Wire continuity
- (4) Insulation resistance test
- (5) Proper settings and calibration
- (6) Functional operation of charger including
  - Control unit
  - Equalize charging
  - Output voltage adjustment
  - Ripple check
  - Alarms
  - Ground detection circuit
  - Meter Operation

#### 1e Packing

Each item shall be seaworthy packed in export packages in sets or pieces. If the package is made of rubber wood (Yang-para or Hevea brasiliensis), the wooden parts shall be treated with wood preservative.

Plastic foam shall not be accepted.



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#### **C2 Material and packing data shall be submitted with the bid by the Bidders**

The bidder has to submit the following data and details of batteries, battery chargers and accessories.

#### **2a Critical documents of the proposed batteries, battery chargers and accessories (See page 12 of 12)**

#### **2b Details of the batteries, battery chargers and accessories:**

##### **2b.1 Batteries**

- Catalogue and technical data showing manufacturer's name or trade mark, type/model, country of origin and reference standard(s)
- Capacity in Ah at various hour rates and various VPC final voltage
- Recommended floating voltage for keep battery in full charged in volt
- Recommended equalizing voltage in volt/charging time in hour
- Full charge specific gravity of electrolyte at 27<sup>0</sup>C (for TIS standard) or full charge specific gravity of electrolyte at 20<sup>0</sup>C (for DIN or IEC standard)
- Quantity of electrolyte in litre/cell
- External dimensions of cell in mm
- Weight of battery without electrolyte in kg
- Weight of battery with electrolyte in kg
- List and details of accessories

##### **2b.2 Battery chargers**

- Catalogue and technical data showing manufacturer's name or trade mark, type/model, country of origin and reference standard(s)
- Input voltage in V
- Output current in A
- Output voltage adjustment for float charge in V
- Output voltage adjustment for equalizing charge in V
- Voltage regulation in % of the preset voltage, for load variations of 0 to 100%
- AC input voltage variations of  $\pm 10\%$ , and frequency variations of  $\pm 2\%$  ( $\pm 1$  Hz)
- Output current limit point setting in % of full load rating
- Operation of equalizing timer
- List and details of accessories

#### **2c Detail drawings of battery set, battery rack, and battery charger with main dimensions in mm**

#### **2d Detail of painting for battery rack**

#### **2e Discharge characteristic of battery and circuit diagram of battery charger**

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**2f Details of the installation, operation, and maintenance instructions**

**2g List of routine tests of batteries and battery chargers**

**2h Packing detail**

Packing method (shown by drawing(s); describe packing materials, details of wood treatment for rubber wood package)

Number of sets or pieces in each package

Dimensions (length x width x height) of each package in cm

Volume of each package in m<sup>3</sup>

Gross weight of each package in kg

Net weight of each package in kg

Number of packages

If several packages are contained in one big case, further details are required:

Number of packages in each case

Dimensions of each case in cm

Volume of each case in m<sup>3</sup>

Gross weight of each package in kg

Number of cases

Type of storage facility required (indoor, outdoor)

**Note: Conditions for documentation**

- The Contractor has to supply following document in English and/or Thai, before shipment/delivery, for each ordered of batteries and battery charger, to the following address:

**Substation Maintenance Division**

Provincial Electricity Authority

200 Ngam Wong Wan Road, Chatuchak

Bangkok Metropolis 10900 Thailand

1.1 Report of routine tests of batteries and battery chargers

1.2 Instruction book for transportation, storage, installation, operation, and maintenance; which shall be packed together in English and/or Thai.

- Delivery time is one of the important factors to be considered.



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**Critical documents of the proposed battery, battery chargers and accessories  
shall be submitted with the bid for each item offered:**

#### Batteries:

Item	Required documents	Proposed technical document	Reference document (Page/Item)
1	Catalogue and technical data showing manufacturer's name or trade mark, type/model, country of origin and reference standard(s)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2	Capacity in Ah at various hour rates and various VPC final voltage	<input type="checkbox"/> Yes <input type="checkbox"/> No	
3	Recommended floating voltage for keep battery in full charged in volt	<input type="checkbox"/> Yes <input type="checkbox"/> No	
4	Recommended equalizing voltage in volt/charging time in hour	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5	Full charge specific gravity of electrolyte at 27°C (for TIS standard) or full charge specific gravity of electrolyte at 20°C (for DIN or IEC standard)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6	Quantity of electrolyte in litre/cell	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7	External dimensions of cell in mm	<input type="checkbox"/> Yes <input type="checkbox"/> No	
8	Weight of battery without electrolyte in kg	<input type="checkbox"/> Yes <input type="checkbox"/> No	
9	Weight of battery with electrolyte in kg	<input type="checkbox"/> Yes <input type="checkbox"/> No	
10	List and details of accessories	<input type="checkbox"/> Yes <input type="checkbox"/> No	
11	Type test reports of battery (see clause <b>1d.1</b> ) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	The copy of previous Purchase Order (PO) (if any) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	The copy of previous contact with list of supplier (if any) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	The copy of previous contact with proposal from (if any) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	PEA Product Acceptance registration certificate (if any) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	Product lists registration certificate (if any)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
12	The TIS 17025 or ISO/IEC 17025 certification and scope of accreditation of the independent laboratories/institutes (in case the independent laboratories/institutes are accredited according to TIS 17025 or ISO/IEC 17025)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
13	Detail drawings of battery set and battery rack with main dimensions in mm	<input type="checkbox"/> Yes <input type="checkbox"/> No	
14	Detail of painting for battery rack	<input type="checkbox"/> Yes <input type="checkbox"/> No	
15	Discharge characteristic of battery	<input type="checkbox"/> Yes <input type="checkbox"/> No	
16	Details of the installation, operation, and maintenance instructions	<input type="checkbox"/> Yes <input type="checkbox"/> No	
17	List of routine tests of batteries	<input type="checkbox"/> Yes <input type="checkbox"/> No	
18	Packing detail (see clause <b>2h</b> )	<input type="checkbox"/> Yes <input type="checkbox"/> No	

**Note:** The bidders who do not submit the critical documents mentioned in the above table with the bid will be rejected.



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#### Battery chargers:

Item	Required documents	Proposed technical document	Reference document (Page/Item)
1	Catalogue and technical data showing manufacturer's name or trade mark, type/model, country of origin and reference standard(s)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2	Input voltage in V	<input type="checkbox"/> Yes <input type="checkbox"/> No	
3	Output current in A	<input type="checkbox"/> Yes <input type="checkbox"/> No	
4	Output voltage adjustment for float charge in V	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5	Output voltage adjustment for equalizing charge in V	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6	Voltage regulation in % of the preset voltage, for load variations of 0 to 100%	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7	AC input voltage variations of $\pm 10\%$ , and frequency variations of $\pm 2\%$ ( $\pm 1$ Hz)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
8	Output current limit point setting in % of full load rating	<input type="checkbox"/> Yes <input type="checkbox"/> No	
9	Operation of equalizing time	<input type="checkbox"/> Yes <input type="checkbox"/> No	
10	List and details of accessories	<input type="checkbox"/> Yes <input type="checkbox"/> No	
11	Type test reports of battery (see clause <b>1d.1</b> ) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	The copy of previous Purchase Order (PO) (if any) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	The copy of previous contact with list of supplier (if any) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	The copy of previous contact with proposal from (if any) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	PEA Product Acceptance registration certificate (if any) or	<input type="checkbox"/> Yes <input type="checkbox"/> No	
	Product lists registration certificate (if any)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
12	The TIS 17025 or ISO/IEC 17025 certification and scope of accreditation of the independent laboratories/institutes (in case the independent laboratories/institutes are accredited according to TIS 17025 or ISO/IEC 17025)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
13	Detail drawings of battery charger with main dimensions in mm	<input type="checkbox"/> Yes <input type="checkbox"/> No	
14	Circuit diagram of battery charger	<input type="checkbox"/> Yes <input type="checkbox"/> No	
15	Details of the installation, operation, and maintenance instructions	<input type="checkbox"/> Yes <input type="checkbox"/> No	
16	List of routine tests of battery chargers	<input type="checkbox"/> Yes <input type="checkbox"/> No	
17	Packing detail (see clause <b>2h</b> )	<input type="checkbox"/> Yes <input type="checkbox"/> No	

**Note:** The bidders who do not submit the critical documents mentioned in the above table with the bid will be rejected.



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### C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description
1	1040090411	set(s)	<p>Battery charger set, with :</p> <p>Input voltage : three-phase, 400 V AC, 50 Hz</p> <p>Output current : not less than 100 A</p> <p>Output voltage adjustment</p> <ul style="list-style-type: none"> <li>- for floating charge : 125 – 150 V DC, or better</li> <li>- for equalizing charge : 125 – 150 V DC, or better</li> </ul> <p>Complete with operating and maintenance instruction manual, and circuit diagram.</p>
2	1040090412	set(s)	<p>Battery charger set, with :</p> <p>Input voltage : three-phase, 400 V AC, 50 Hz</p> <p>Output current : not less than 100 A</p> <p>Output voltage adjustment</p> <ul style="list-style-type: none"> <li>- for floating charge : 48 – 60 V DC, or better</li> <li>- for equalizing charge : 48 – 60 V DC, or better</li> </ul> <p>Complete with operating and maintenance instruction manual, and circuit diagram.</p>
3	1040090414	set(s)	<p>Battery charger set, with :</p> <p>Input voltage : single-phase, 230 V AC, 50 Hz</p> <p>Output current : not less than 30 A</p> <p>Output voltage adjustment</p> <ul style="list-style-type: none"> <li>- for floating charge : 48 – 60 V DC, or better</li> <li>- for equalizing charge : 48 – 60 V DC, or better</li> </ul> <p>Complete with operating and maintenance instruction manual, and circuit diagram.</p>
4	1040090417	set(s)	<p>Battery charger set, with :</p> <p>Input voltage : single-phase, 230 V AC, 50 Hz</p> <p>Output current : not less than 50 A</p> <p>Output voltage adjustment</p> <ul style="list-style-type: none"> <li>- for floating charge : 125 – 150 V DC, or better</li> <li>- for equalizing charge : 125 – 150 V DC, or better</li> </ul> <p>Complete with operating and maintenance instruction manual, and circuit diagram.</p>

**C3 Schedule of detailed requirement**

**Invitation to Bid No.:**

<b>Item</b>	<b>PEA Material No.</b>	<b>Quantity</b>	<b>Description</b>
5	1040090300	set(s)	Stationary battery set, with: Nominal capacity at 10 h rate : not less than 90 Ah and 1.80 VPC final voltage Complete with accessories and instruction manual.
6	1040090301	set(s)	Stationary battery set, with: Nominal capacity at 10 h rate : not less than 210 Ah and 1.80 VPC final voltage Complete with accessories and instruction manual.
7	1040090304	set(s)	Stationary battery set, with: Nominal capacity at 10 h rate : not less than 200 Ah and 1.80 VPC final voltage Complete with accessories and instruction manual
8	1040090307	set(s)	Stationary battery set, with: Nominal capacity at 10 h rate : not less than 130 Ah and 1.80 VPC final voltage Complete with accessories and instruction manual
9	1040090308	set(s)	Stationary battery set, with : Nominal capacity at 10 h rate : not less than 250 Ah and 1.80 VPC final voltage Complete with accessories and instruction manual
10	1040090309	set(s)	Stationary battery set, with : Nominal capacity at 10 h rate : not less than 350 Ah and 1.80 VPC final voltage Complete with accessories and instruction manual



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Specification No.: RMIS-072/2562: STATIONARY BATTERIES, BATTERY CHARGERS, AND ACCESSORIES

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### C3 Schedule of detailed requirement

Invitation to Bid No.:

Item	PEA Material No.	Quantity	Description																																
			<p><b>Note:</b></p> <p>(1) The following stationary battery products/manufacturers are proved to be conformed with the specification:</p> <table><tr><th>No.</th><th>Products/Manufacturers</th><th>Country</th><th>Type/Model</th></tr><tr><td>1</td><td>HOPPECKE</td><td>Germany</td><td>Grid power VL2-215 (OPzS)</td></tr><tr><td>2</td><td>Exide<sup>®</sup> Classic</td><td>France or Germany</td><td>OPzS</td></tr><tr><td>3</td><td>FIAMM</td><td>Italy</td><td>LM OPzs</td></tr><tr><td>4</td><td>EnerSys</td><td>France</td><td>PowerSafe<sup>®</sup> OPzS</td></tr></table> <p>The type test reports according to <b>clause 1d.1</b> are not required for the above batteries. The other products can be proposed but the type test reports according to <b>clause 1d.1</b> shall be submitted with the bid for consideration.</p> <p>(2) The following battery charger products/manufacturers are proved to be conformed with the specification:</p> <table><tr><th>No.</th><th>Products/Manufacturers</th><th>Country</th><th>Type/Model</th></tr><tr><td>1</td><td>Bira Brothers</td><td>Thailand</td><td>CG-</td></tr><tr><td>2</td><td>EXZON</td><td>Thailand</td><td>LFB3-</td></tr></table> <p>The type test reports according to <b>clause 1d.1</b> are not required for the above battery chargers. The other products can be proposed but the type test reports according to <b>clause 1d.1</b> shall be submitted with the bid for consideration.</p>	No.	Products/Manufacturers	Country	Type/Model	1	HOPPECKE	Germany	Grid power VL2-215 (OPzS)	2	Exide <sup>®</sup> Classic	France or Germany	OPzS	3	FIAMM	Italy	LM OPzs	4	EnerSys	France	PowerSafe <sup>®</sup> OPzS	No.	Products/Manufacturers	Country	Type/Model	1	Bira Brothers	Thailand	CG-	2	EXZON	Thailand	LFB3-
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C4 Price schedule

Invitation to Bid No.:

Manufacturer :

Country of origin :

Trade-mark :

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
1	1040090411		Battery charger set, with : Input voltage : ----- Output current : ----- Output voltage adjustment for floating charge : ----- for equalizing charge : ----- Complete with operating and maintenance instruction manual, and circuit diagram			
2	1040090412		Battery charger set, with : Input voltage : ----- Output current : ----- Output voltage adjustment for floating charge : ----- for equalizing charge : ----- Complete with operating and maintenance instruction manual, and circuit diagram			



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**C4 Price schedule**

**Invitation to Bid No.:**

**Manufacturer :**

**Country of origin :**

**Trade-mark :**

Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
3	1040090414		Battery charger set, with : Input voltage : ----- Output current : ----- Output voltage adjustment for floating charge : ----- for equalizing charge : ----- Complete with operating and maintenance instruction manual, and circuit diagram			
4	1040090417		Battery charger set, with : Input voltage : ----- Output current : ----- Output voltage adjustment for floating charge : ----- for equalizing charge : ----- Complete with operating and maintenance instruction manual, and circuit diagram			

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Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
5	1040090300		Stationary battery set, with : Nominal voltage : ..... Nominal capacity at 10 h rate and 1.80 VPC final voltage : .....Ah Complete with instruction manual.			
6	1040090301		Stationary battery set, with : Nominal voltage : ..... Nominal capacity at 10 h rate and 1.80 VPC final voltage : .....Ah Complete with instruction manual.			
7	1040090304		Stationary battery set, with : Nominal voltage : ..... Nominal capacity at 10 h rate and 1.80 VPC final voltage : .....Ah Complete with instruction manual.			

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Item	PEA Material No.	Catalogue No.	Description	Quantity	Unit Cost (See details & conditions attached)	Total Cost (See details & conditions attached)
8	1040090307		Stationary battery set, with : Nominal voltage : ..... Nominal capacity at 10 h rate and 1.80 VPC final voltage : .....Ah Complete with instruction manual.			
9	1040090308		Stationary battery set, with : Nominal voltage : ..... Nominal capacity at 10 h rate and 1.80 VPC final voltage : .....Ah Complete with instruction manual.			
10	1040090309		Stationary battery set, with : Nominal voltage : ..... Nominal capacity at 10 h rate and 1.80 VPC final voltage : .....Ah Complete with instruction manual.			